Risk & Reliability

Applying Risk Analysis to Hurricane & Flood Protection Solutions

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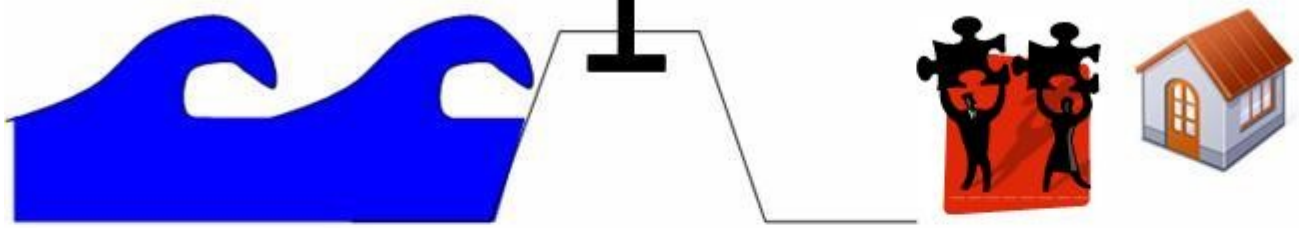
IPET Risk Assessment Model

HAZARD → SYSTEM PERFORMANCE → CONSEQUENCES → RISK



Water levels – surge and wave height at 138 locations

152 hurricanes - 25-yr to 5,000 + frequency

Variety of intensities, sizes, speeds and tracks

Pre-Katrina, Current, Future

Performance of entire 350-mile system (134 reaches, 350 features)

Overtopping, potential breaches, rainfall, pumping

Probability of flooding in each sub-basin

Potential Property damage and loss of life caused by flooding

Based on pre-Katrina population and property conditions for each sub-basin in New Orleans and vicinity

Index of relative losses in terms of Life & Property

RISK = Chance of Flooding from Hurricanes X Loss of Property or Life

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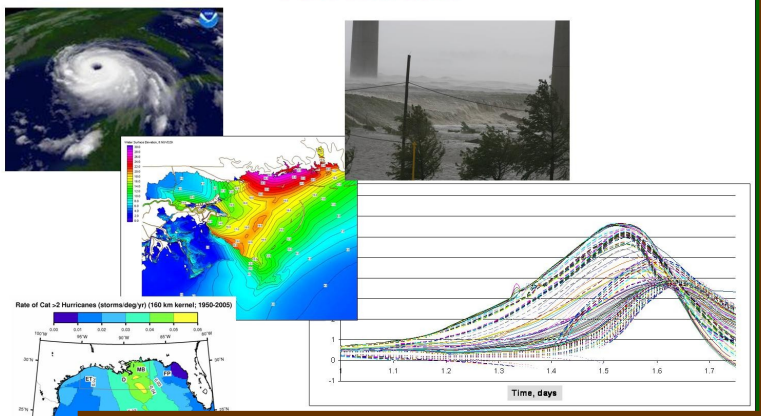
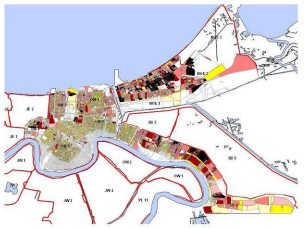
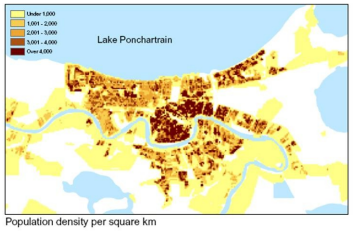
IPET Risk Assessment Model

The Hazard



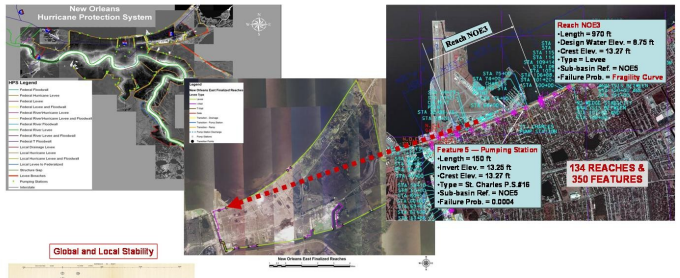
Consequences

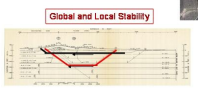


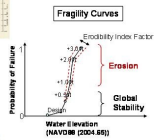


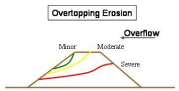
Pre-Katrina Situation Only

The System Reliability


New Orleans Hurricane Protection System
Reach NOE3
Reach NOE3
•Length = 970 ft
•Design Water Elev. = 8.75 ft
•Crest Elev. = 13.27 ft
•Type = Levee
•Sub-basin Ref. = NOE5
•Failure Prob. = Fragility Curve
Feature 5 — Pumping Station
•Length = 150 ft
•Invert Elev. = 13.25 ft
•Crest Elev. = 13.27 ft
•Type = St. Charles P.S.#16
•Sub-basin Ref. = NOE5
•Failure Prob. = 0.0004
134 REACHES & 350 FEATURES



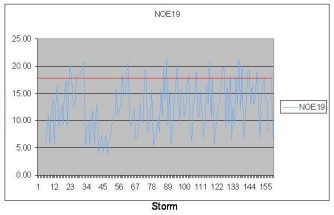


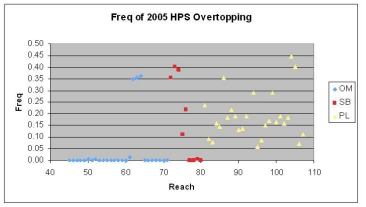


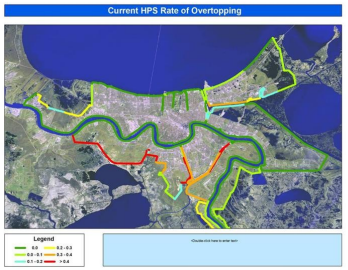
Chance of volume of water entering protected area by rain, overtopping or breaching

134 Reaches and 350 Features for 3 HPS Geometries

Risk Assessment Information







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Communicating the Results

- Inform & Educate
  - Empower public decision making to manage risks and consequences
- “Share not Scare”
- Use of the model
- Information to answer questions
  - Informed team members carry The Message to others
- Develop what is released
  - Team members assist in crafting an easily understood message

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Dynamic Interaction

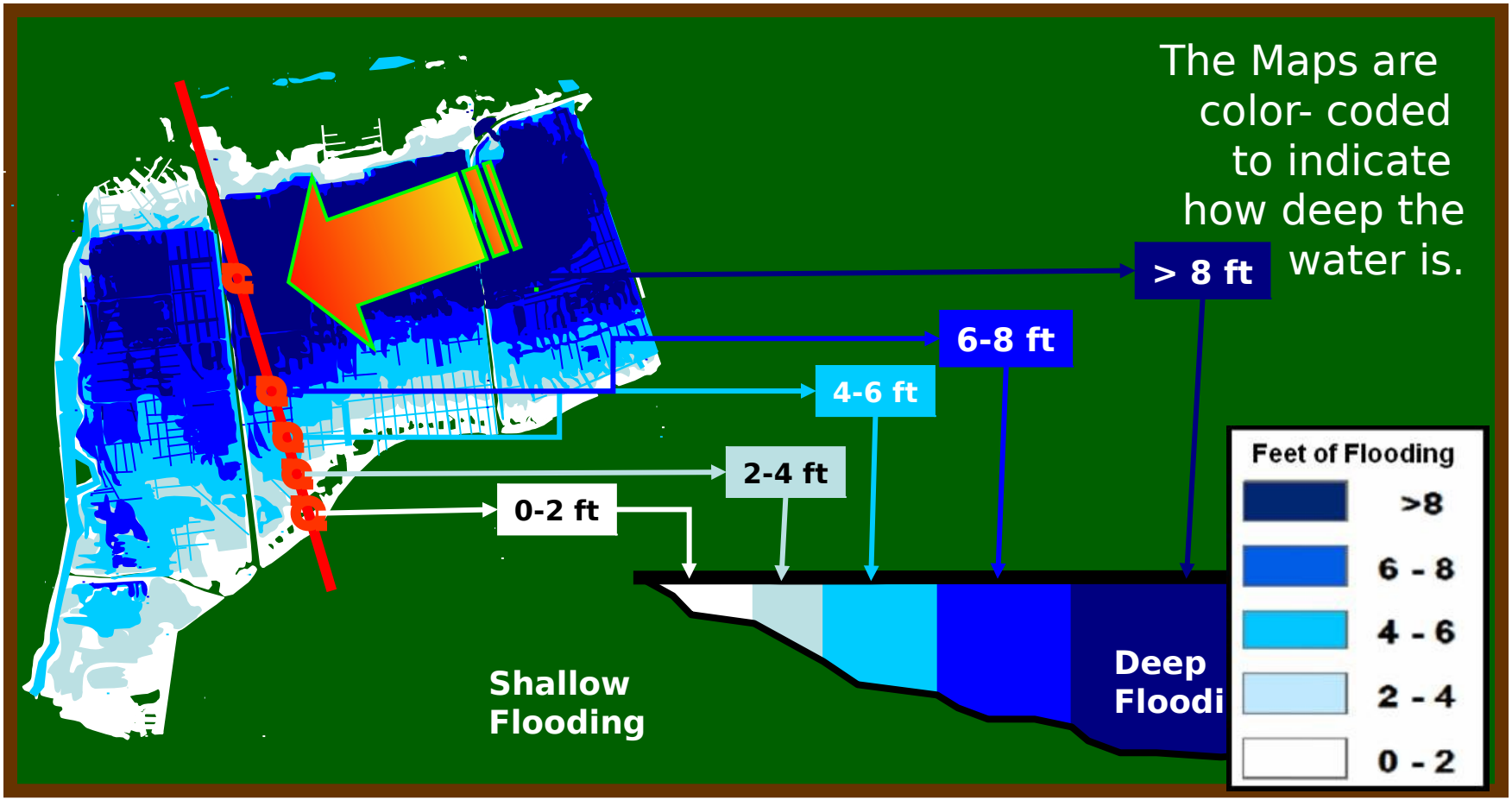
The Public Said:

- We know we are at risk
- This is not forward – looking
- What we need to know
  - Our impacts
  - What's currently being done
  - What will be done to mitigate
- Looks like you have errors in data, check and correct
- Gave suggestions to improve product format
  - Color changes
  - Word changes
  - Slide style changes
  - Graphics changes

We Responded:

- Changed focus from highlighting risk to highlighting system-wide capability to identify & manage it
- Interactive internet-based products so public can use
- Links to ongoing work and to future work
- Verified model inputs
- Used suggestions
  - Colors from Green to Red to shades of Blue
  - Consequences expressed in percent improvement
  - "Blackboard" slides
- More animations / less words

Example of Public Product



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Click Mouse For Animation

Probability in Perspective

Recurrence Interval	Probability of Occurring in any year		% Chance of Occurring In:		
"X Year"	"1in X"	"%"	30 years (mortgage)	78 years (Average US lifespan)	100 years
500	1 in 500	0.2 %	5.8 %	14.5 %	18 %
100	1 in 100	1 %	26 %	54 %	63 %
50	1 in 50	2 %	45 %	79 %	86 %
25	1 in 25	4 %	64 %	96 %	98 %
10	1 in 10	10 %	96 %	99.9 %	100 %

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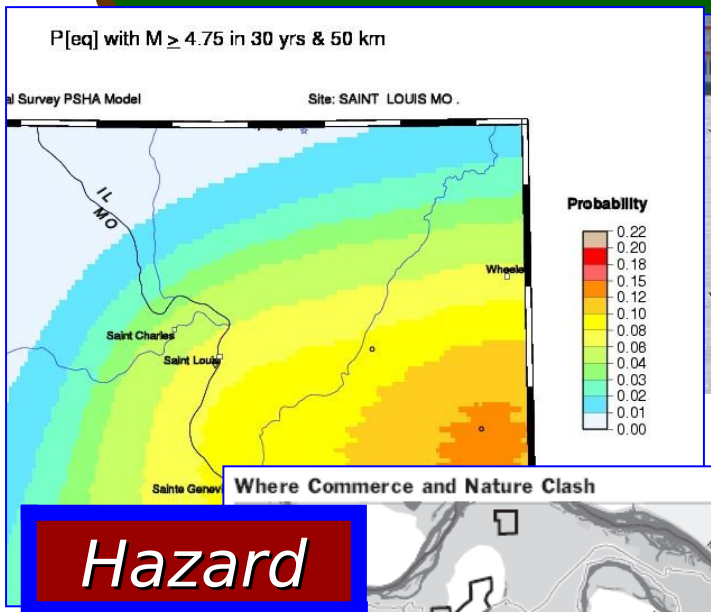
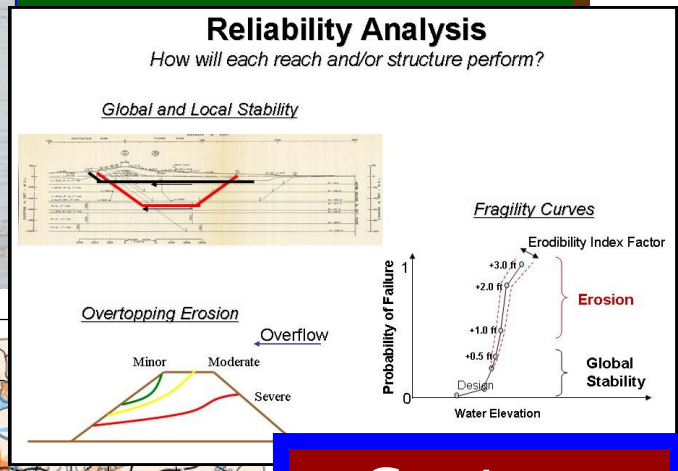
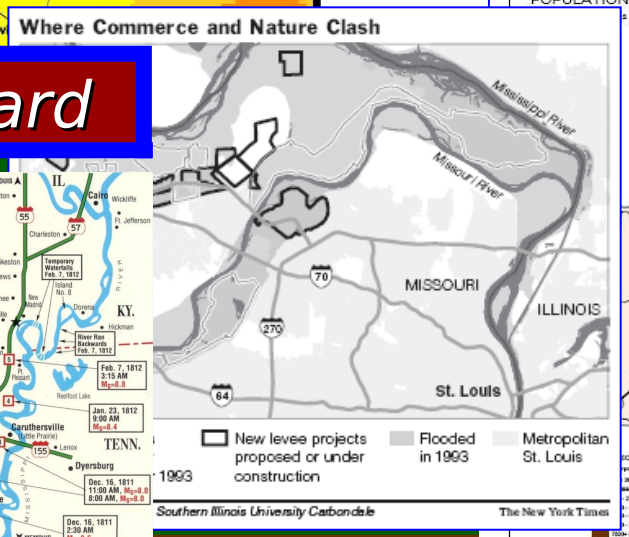
Applying to Other Areas

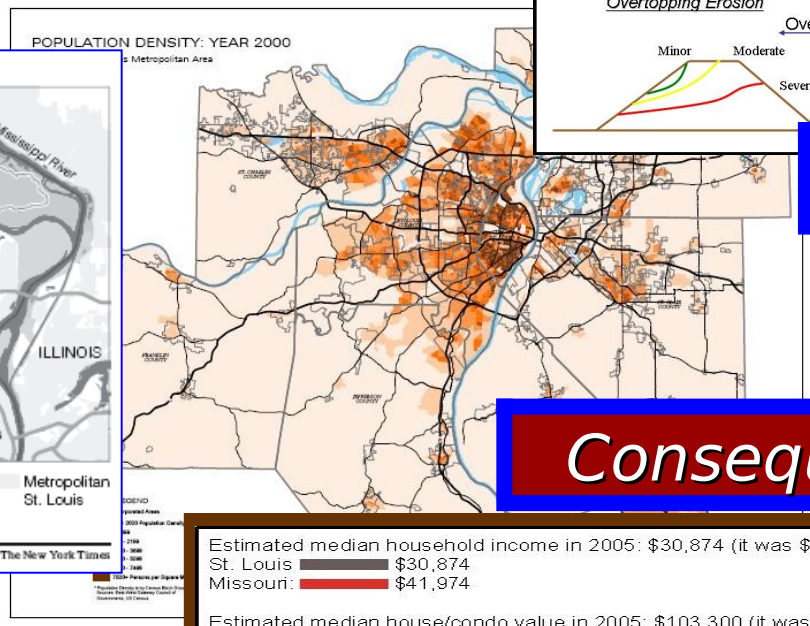


Hazard



System





Consequences

Estimated median household income in 2005: $30,874 (it was $27,156 in 2000)
St. Louis $30,874
Missouri: $41,974

Estimated median house/condo value in 2005: $103,300 (it was $63,900 in 2000)
St. Louis $103,300
Missouri: $123,100

Median gross rent in 2005: $567.
Percentage of residents living in poverty in 2005: 25.4%
(15.1% for White Non-Hispanic residents, 34.4% for Black residents)

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Summary

- Risk Assessment Modeling is possible
  - Collaborative interaction – common operating picture
  - Use in New Orleans shows benefits
- Based on Science & Engineering
  - Communicate Facts
- Empowers Risk – Based Decisions by stakeholders

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